

**IN THE DRAWINGS:**

Subject to approval by the Examiner, Figures 3, 4, 5 and 7 have been amended so that reference numerals and characters are plain and legible. Upon approval of the drawings by the Examiner and allowance of this application, Applicant will submit formal drawings that incorporate these modifications.

**REMARKS**

The Office Action dated October 1, 2003 has been received and carefully noted. The amendments made herein, together with the following remarks, are submitted as a full and complete response thereto.

By this Amendment, Applicant has amended the Title of the Invention and amended Figures 3, 4, 5 and 7 to address minor objections cited in the Office Action. Applicant submits that no new matter has been added by the amendments made in the Title of the Invention and the drawings filed herewith. Therefore, claims 6-16 are pending in the present application and are respectfully submitted for consideration.

I. TITLE

The title of the invention is objected to as not being descriptive of the invention. The title is amended to obviate this objection. Withdrawal of the objection is respectfully requested.

## II. DRAWINGS

The drawings were objected to for the reasons cited by the Draftsperson on the PTO Form 948. In view of the foregoing revisions and the following remarks, Applicant respectfully requests the withdrawal of this objection.

In Figs. 3, 4, 5, and 7, Applicant has amended the reference numerals and characters so that they are plain and legible. These revisions are fully supported by the specification, including the claims, and do not add new matter. Formal drawings are being submitted with this Response which incorporate these modifications.

## III. CLAIM REJECTIONS UNDER 35 USC § 103

Claims 6, 7, and 13-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang et al. (U.S. Patent No. 5,771,382) in view of Gamache et al. (U.S. Patent No. 5,202,991). The Office Action alleged that Wang discloses all of the elements of the claimed invention, with the exception of an operating system having a critical area. The Office Action relied upon Gamache to allegedly cure the deficiencies of Wang. Applicant submits that the prior art cited in the Office Action fails to teach, suggest or disclose the features of the claimed invention. Therefore, the rejection is respectfully traversed and reconsideration is respectfully requested for the reasons which follow.

Claim 6, upon which claims 7-12 are dependent, recites a method of symmetric multiprocessing for an operating system having critical and non-critical areas. The method includes a step of responding to a thread requiring a call to a critical area of the

operating system by requesting a global lock. The method also includes a step of responding to the global lock being available by performing the steps of acquiring the global lock, performing the call to the critical area of the operating system and releasing the global lock.

Claim 13 recites a computer system including one or more processors, a memory medium, a communication network, and a lock manager. The memory medium stores an operating system having critical and non-critical areas, in a machine executable form, and a lock manager in a machine executable form. The lock manger is configured to be operable to respond to a thread requiring a call to a critical area of the operating system by requesting a global lock. The lock manager is also configured to be operable to respond to the global lock being available by performing the steps of acquiring the global lock, performing a call to the critical area of the operating system and releasing the global lock.

Claim 14 recites an apparatus for symmetric multiprocessing, which includes an operating system means and responsive means. The operating system means has critical and non-critical areas. A means responsive to a thread requires a call to a critical area of the operating system by requesting a global lock. A means responsive to the global lock is configured to be available by performing the steps of acquiring the global lock, performing a call to the critical area of the operating system and releasing the global lock.

Claim 15 recites a computer readable memory medium, storing computer software code. The computer software code is executable to perform a step of responding to a

thread requiring a call to a critical area of an operating system having critical and non-critical areas, by requesting a global lock. The computer software is also executable to perform a step of responding to the global lock being available by performing the steps of acquiring the global lock, performing a call to the critical area of the operating system and releasing the global lock.

Claim 16 recites a computer data signal embodied in a carrier wave. The computer data signal includes a set of machine executable code being executable by a computer to perform a step of responding to a thread requiring a call to a critical area of an operating system having critical and non-critical areas, by requesting a global lock. The computer is also executable to perform a step of responding to the global lock being available by performing the steps of acquiring the global lock, performing a call to the critical area of the operating system and releasing the global lock.

As a result of the claimed invention, a symmetric multiprocessing system and method for an operating system having critical and non-critical areas is provided which is capable of applying a single lock strategy to a micro kernel operating system design which delegates functionality to external processes. The micro kernel is capable of executing its operations very quickly while the proper thread management protects the external processes. Because only a single lock is required, the invention is able to identify the status of and acquire the lock very quickly. Thus, there is no danger of encountering deadlocks as in the case of operating systems that include multiple locks.

These advantages are not all-inclusive but are merely exemplars of some of the benefits of the invention.

Applicant submits that the prior art fails to disclose or suggest the elements of the invention as set forth in the claimed invention, and thereby fails to provide the critical and nonobvious advantages that are provided by the invention. To establish a prima facie case of obviousness, the prior art reference (or references when combined) must teach or suggest all of the claimed limitations. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. The teaching or suggestion to make the claimed combination must be found in the prior art, and not be based on Applicant's disclosure. See M.P.E.P. §§ 2143.01 and 2143.03.

Wang discloses a system and method for synchronizing static variable initialization and reference (SVIR) in a multi-threaded computer environment. The device in Wang allegedly operates by locking a central processing unit (CPU) during the identification of the first thread seeking to initiate a static variable operation, maintaining all other threads in a wait state and unlocking the CPU thus releasing the waiting threads from their wait state after the first thread has completed its SVIR operation.

Gamache discloses an apparatus and method of controlling the supply of available tasks that may be executed by a blocked processor while the blocked processor's work has been temporarily blocked by a conflict with another processor. Gamache suggests that such blocking may occur when one processor attempts to enter a critical region of

code where the other processor is currently working. Critical regions may be set up to protect data stored in a shared memory against conflicting accesses by two or more processors.

Applicant submits that the cited references fail to teach or suggest the claimed invention because Wang, as admitted by the Office Action, does not disclose a critical area of an operating system. Wang also fails to disclose or suggest “an operating system having critical and non-critical areas.” The Federal Circuit court in *Bell Communications Research v. Vitalink Communications Corp.* 34 USPQ2d 1816 (Fed. Cir. 1995) ruled that a claim with a body which expressly refers back to an element in the preamble incorporates by reference the preamble phrase (e.g. by saying “said [element]”). That is, because the preamble reads “an operating system having critical and non-critical areas”, the limitations of “having critical and non-critical areas” are incorporated into the body of claim 6 at each recitation of the “operating system.”

As described in the specification on page 7, lines 13-32 and page 11, lines 3-5 and 20-28, the invention is typically implemented in a micro-kernel environment, where threads may consist of calls to both critical and non-critical areas of the operating system. The invention is capable of determining whether a call is made to either the critical or the non-critical area. One reason that the invention differentiates between whether a call is made to a critical or a non-critical area is in order to determine whether to issue a lock during the call. In the prior art, when a call is made to the operating system, a lock is held for the entirety of the call. With the present invention, the lock need only be held

during the part of the call to the critical area of the operating system and not during a call directed to a non-critical area.

The Office Action relies upon Gamache to allegedly cure the deficiencies of Wang. However, Gamache also does not teach, disclose or suggest “an operating system having critical and non-critical areas.” The Examiner suggested that column 2, lines 12 - 19 of Gamache discloses that “an operating system can have a critical area”. Although Gamache does disclose critical areas or regions, Gamache et al. fails to disclose or suggest an operating system including both critical and non-critical areas. Gamache, instead, discloses a device where the entire operating system is a critical area as shown in Fig. 1. Namely, there is no non-critical area in the operating system. Therefore, neither Wang nor Gamache discloses or suggests differentiating between a call issued to a critical or a non-critical area. In fact, none of the references cited in the Office Action describe an operating system having separate critical and non-critical areas. Logically, it follows since none of the cited references describe operating system that is capable of receiving calls to critical and non-critical areas, then none of the cited references teaches the step of acquiring a lock only during a call to the critical area of the operating system. Instead, the cited references teach of devices that acquire and hold a lock on the entire operating system during a call.

Since neither Wang nor Gamache discloses or teach an operating system having critical and non-critical areas, Applicant respectfully submits that neither Wang nor Gamache, taken in combination or alone, renders the claimed invention obvious.

In addition, claim 7 depends from claim 6, and is therefore allowable at least for the reasons claim 6 is allowable, respectively, and for the specific limitations recited therein.

Claims 8-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang et al. (U.S. Patent No. 5,771,382) in view of Gamache et al. (U.S. Patent No. 5,202,991) and in further view of Dangelo (U.S. Patent No. 5,946,487). The Office Action alleged that Wang in view of Gamache discloses all of the elements of the claimed invention, except an operating system which is a micro kernel operating system. The Office Action relied upon Dangelo to allegedly cure the deficiencies of Wang in view of Gamache. Applicant submits that the prior art cited in the Office Action fails to teach, suggest or disclose the features of the claimed invention. Therefore, the rejection is respectfully traversed and reconsideration is respectfully requested for the reasons which follow.

Dangelo discloses an object-oriented, multi-media architecture for real-time processing of an incoming stream of pseudo-language byte codes compiled from an object-oriented source program. The architecture includes a real-time micro-kernel operating system that routes the objects, threads and the Java byte codes to multiple cores or parallel processors. Dangelo also discloses a mutual exclusion lock that allows only one thread at a time to execute a given piece of code.

Although Dangelo mentions a micro-kernel operating system, Dangelo does not cure the shortcomings of the combination of Wang and Gamache. Namely, Dangelo,



similar to Wang and Gamache, fails to disclose an operating system having critical and non-critical areas. Furthermore, the Dangelo serves a different purpose and functions in a different manner than the present invention so that one skilled in the art would not look to Dangelo in order to address the problems solved by the present invention. Dangelo seeks to provide an object-oriented, multi-media architecture that provides real-time processing of multiple cores or parallel processors. The objective of Dangelo is not related to the purpose of the present invention, which is to improve the performance of symmetric multiprocessing systems by improving the lock-handling process.

In addition, the micro kernel operating system, as defined in Dangelo, does not function as a typical micro kernel operating system or as the micro kernel operating system as defined in the present invention. A micro kernel operating system performs minimum tasks within the system and assigns the bulk of the responsibilities to other processes. On the hand, an operating system, which performs the bulk of the tasks, is typically referred to as a monolithic operating system. The present invention discusses the differences between a micro kernel and a monolithic operating system. On page 6, line 34 – page 7, line 3 of the present invention, it reads, “A micro kernel operating system is one in [which] the operating system itself provides minimal services which delegate the usual operating system functions to external processes. These services are generally described as Inter-Process Control or IPC services.” On page 9, lines 24-32, the present invention discusses that a micro kernel operating system, according to the present invention, distributes the functionality of the operating system into separate files

as much as possible, leaving only a kernel with message passage capabilities to administer the operating systems. Meanwhile, monolithic operating systems contain the bulk of all operating system services including tasks such as all file handling, and input and output handling.

In comparing Dangelo and the present invention, the device in Dangelo functions according to the description of a monolithic operating system as defined in the present invention and not as a micro kernel operating system as described in the present invention. The micro kernel operating system, defined at column 9, lines 35 - 54 of column 9 of Dangelo, clearly defines a "micro kernel" operating system as what is known as a "monolithic" operating system", as it performs far more internal processing: "The micro-kernel also attends to handling the network file system (NFS), networking operations, peripheral device drivers, virtual memory management, user interface, and other tasks for which the operating system conventionally is responsible." Thus, Dangelo serves a different purpose and functions in a different manner than the claimed invention.

In addition, claims 8-10 depend from claim 6, and are therefore allowable at least for the reasons claim 6 is allowable, respectively, and for the specific limitations recited therein.

In sum, Wang, Gamache, and Dangelo, taken in combination or alone, fails to teach or suggest fails to disclose an operating system having critical and non-critical areas. Dangelo also serves a different purpose and functions in a different manner than the claimed invention. Thus, it would not have been obvious to one of ordinary skill in

the art to look to the teaching of Dangelo to solve the problems addressed by the present invention. Therefore, the cited references fail to render the claimed invention obvious.

Claims 11 and 12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang et al. (U.S. Patent No. 5,771,382) in view of Gamache et al. (U.S. Patent No. 5,202,991) in view of Dangelo (U.S. Patent No. 5,946,487) and in further view of Jones et al. (U.S. Patent No. 5,812,844). The Office Action alleged that Wang in view of Gamache and Dangelo discloses all of the elements of the claimed invention, except the step of prioritizing execution of threads and the step of scheduling the execution of the threads. The Office Action relied upon Jones to allegedly cure the deficiencies of Wang in view of Gamache and Dangelo. Applicant submits that the prior art cited in the Office Action fails to teach, suggest or disclose the features of the claimed invention. Therefore, the rejection is respectfully traversed and reconsideration is respectfully requested for the reasons which follow.

Jones discloses a method and system for scheduling the execution of threads using time-specific scheduling constraints. A scheduler schedules the execution of a plurality of threads based upon either a percentage processor time scheduling constraint or a deadline scheduling constraint, which indicates that a specified quantity of work should be performed by a specified time deadline. For each thread specifying a deadline scheduling constraint, the scheduler determines a restart time corresponding to the deadline scheduling constraint. The scheduler then utilizes the determined restart time

for scheduling the threads by selecting the thread having the earliest restart time for execution.

Nevertheless, as discussed above, neither Jones nor any of the other cited references, teach or disclose an operating system having critical and non-critical areas. Thus, the cited references fails to disclose or teach every element of the claimed invention. Furthermore, claims 11 and 12 depend from claim 6, and are therefore allowable at least for the reasons claim 6 is allowable, respectively, and for the specific limitations recited therein.

For at least these reasons, Applicant respectfully submits that claims 6-16 are patentable over Wang, Gamache, Dangelo and Jones, taken in combination or alone.

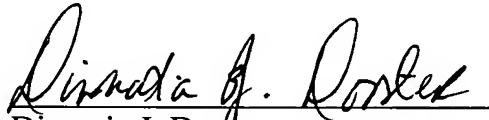
### **CONCLUSION**

As discussed above, Applicant submits that certain clear and important distinctions exist between the cited prior art and the claimed invention. Applicant submits that these distinctions are more than sufficient to render the claims of the invention unanticipated by and unobvious in view of the prior art. It is therefore requested that claims 6-16 be found allowable, and this application passed to issue.

Having addressed each of the foregoing rejections or objections, it is respectfully submitted that this application is now in condition for allowance. Notice to that effect is respectfully requested. Should the Examiner believe anything further is desirable in order to place this application in better condition for allowance, the Examiner is requested to contact the undersigned at the telephone number listed below.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



Dinnatia J. Doster  
Registration No. 45,268

**Customer No. 32294**  
SQUIRE, SANDERS & DEMPSEY LLP  
14<sup>TH</sup> Floor  
8000 Towers Crescent Drive  
Tysons Corner, Virginia 22182-2700  
Telephone: 703-720-7800  
Fax: 703-720-7802

DJD:lls

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4 Sheets of Marked-Up Drawings